



THE COMMONWEALTH OF MASSACHUSETTS

WATER RESOURCES COMMISSION

100 CAMBRIDGE STREET, BOSTON MA 02114

Policy for Developing Water Needs Forecasts for Public Water Suppliers and Communities and Methodology for Implementation

December 13, 2007

Revised May 1, 2009

I. POLICY STATEMENT

It is the policy of the Commonwealth of Massachusetts that the Water Resources Commission (WRC) shall develop water needs forecasts for public water suppliers and communities seeking increased water withdrawals under the Water Management Act (WMA) and for other purposes as deemed appropriate by the Commission. As a result of the development of the water needs forecast, the WRC may make recommendations to the public water suppliers or communities regarding water use, system efficiency or other issues. Where such water needs forecasts may be pursued for actual withdrawal use by a public water supplier or community, at a minimum, permitting by the Massachusetts Department of Environmental Protection (MassDEP) is required.

II. BACKGROUND AND REQUIREMENTS FOR DEVELOPING A WATER NEEDS FORECAST FOR PUBLIC WATER SUPPLY SYSTEMS

A. Introduction and History

This policy is consistent with the requirements of the WMA (M.G.L. Chapter 21G), which states that the Department of Environment Protection and the Water Resources Commission:

shall cooperate in the planning, establishment and management of programs to assess the uses of water in the commonwealth and to plan for future water needs.

The commission shall adopt principles, policies and guidelines necessary for the effective planning and management of water use and conservation in the commonwealth and for the administration of this chapter as necessary and proper to ensure an adequate volume and quality of water for all citizens of the commonwealth, both present and future. Such principles, policies and guidelines shall be designed to protect the natural environment of the water in the commonwealth; to assure comprehensive and systematic planning and management of water withdrawals and use in the commonwealth, recognizing that water is both finite and renewable; and to allow continued and sustainable economic growth throughout the commonwealth and increase the social and economic well being and safety of the commonwealth's citizens and of its work force.

These responsibilities coincide with the WRC's responsibilities under M.G.L. chapter 21A, which include:

- (a) development of a water resources management policy framework within which the water resource policies, plans and management programs of the several agencies and departments under the secretary shall function; (b) coordination of water resources planning and management functions among the several agencies and departments under the secretary.

In 1991, the Water Resources Commission approved a methodology to forecast the estimated volume of water needed by the population served by a public water supply system at a specific date in the future. That methodology was, in turn, a revision of one that was developed in the mid-1980s. The methodology was approved in 1991 and the Policy for Developing Water Needs Forecasts was approved in 2001. Since that time, the Commonwealth has updated its Water Conservation Standards (EOEA and WRC 2006), an action recommended in the 2004 Massachusetts Water Policy (EOEA 2004). Water conservation and management requirements are also addressed through WRC review and approval of interbasin transfers in accordance with the Interbasin Transfer Act and its performance standards (available at <http://www.mass.gov/dcr/waterSupply/intbasin/docs/finalps.doc>). In addition, there has been a general trend toward increasing system efficiency and improved water system management by public water supply systems. This revision of the water needs forecasting policy and methodology reflects these more recent trends.

B. Purpose and Approach

Public water suppliers and communities seeking to increase water withdrawal volumes from existing water supply sources or to obtain approval for new withdrawals under the WMA must institute reasonable conservation practices and measures consistent with efficient utilization of water throughout all components of their water supply system. They also are strongly advised to satisfy current and future water needs by investigating all feasible sources of supply and conservation as outlined in the Massachusetts Water Policy (EOEA 2004) and the Water Conservation Standards (EOEA and WRC 2006). This document provides guidance on how to obtain a water needs forecast and explains the methodology used by the Water Resources Commission to develop water needs forecasts. The methodology is based on historic and existing water-use patterns, population projections, and employment projections, and it incorporates water-use efficiency and conservation standards.

A water needs forecast is the estimated volume of water a public water supplier will need to provide to meet community needs at a given time in the future. It does not address water source availability or impacts that additional water withdrawals may have on water resource sustainability, environmental resources, or competing users. A water needs forecast is not intended as a water-use entitlement; it does not comment on which source a community should use in order to meet future needs; nor does it comment on how much of a source can be used or if a redundant source should be permitted. In addition, forecasts may be conditioned by MassDEP based on an analysis of physical and environmental constraints and impacts of specific water supplies.

Step One: Consultation. A public water supplier or community that is planning to renew a WMA permit, or is experiencing an increase in water withdrawals and is approaching its registered or permitted withdrawal volume and expects future increases to continue, should contact WRC staff at the Department of Conservation and Recreation, Office of Water Resources, to request a new water needs forecast. Staff will guide water suppliers, communities, and their consultants in the preparation of a request for a water needs forecast. This will involve compilation by the water supplier of existing water-use data. WRC staff will review the existing data and system operations to determine the current status of water use, water-use efficiency and community growth indicators affecting water use. Based on this review, WRC staff will determine whether there are adequate data to prepare a forecast. If adequate data are not available, staff may make recommendations for the collection of additional information and may recommend a temporary allocation of water, as described in section E, below.

Step Two: Developing a Forecast. Working with the water supplier and/or community, WRC staff will develop a draft water needs forecast. The Water Resources Commission has delegated to staff the responsibility to use the approved methodology and develop and finalize the forecasts, waiving its formal review and approval process for each individual forecast. This forecast will be reviewed by the water supplier and community before being finalized. Once the forecast is finalized, the water supplier or community may use these volumes in its application to MassDEP for a Water Management Act water withdrawal permit or for other planning purposes. The WRC will consider requests to review an individual forecast by a Commission member, by a representative of the affected community, or by WRC staff. WRC staff will regularly inform the WRC of forecasts prepared.

C. Incorporation of the Most Recent Water Conservation Standards

The water needs forecasting methodology incorporates the Water Conservation Standards for the Commonwealth of Massachusetts (EOEA and WRC 2006 or latest version) and assumes that water suppliers will develop plans and programs to comply with these standards.

The standard for unaccounted-for water, Standard 2.3 of the Water Conservation Standards, is to “meet or demonstrate steady progress toward meeting 10% unaccounted-for water as soon as practicable, especially in those communities in a basin with a higher level of stress.” The standard for residential water use, Standard 5.2 of the Water Conservation Standards, is to “meet or demonstrate steady progress toward meeting residential water use of 65 gallons per capita per day (gpcd) including both indoor and outdoor use as soon as practicable, especially in those communities in a basin with a higher level of stress.” The WRC also expects that water suppliers and communities will implement the Water Conservation Standards in other categories of use and will work with industrial, commercial, institutional, and other sectors to reduce inefficient and/or unnecessary water consumption.

The Water Conservation Standards (EOEA and WRA 2006) allow for flexibility, stating “The Commonwealth recognizes the existence of circumstances that could affect a community’s efforts to fully meet these standards. These circumstances could include aging infrastructure and large seasonal population fluctuations. In such cases, the community should document, as part of its regulatory requirements, all efforts that have been undertaken to comply...” Water suppliers and

communities are encouraged to discuss their specific circumstances with WRC staff as soon as possible in the process outlined in Section B above.

D. Minimum Requirements for Preparation of a Water Needs Forecast

All public water suppliers or communities seeking new water needs forecasts must meet minimum conditions, described below; these conditions are intended to provide WRC staff with accurate and sufficient data needed for assessing water use. It is not possible to reliably develop forecasts using the WRC-approved methodology unless these data are provided. For certain communities with significant seasonal population fluctuations, such as on Cape Cod and the Islands, determining accurate populations served can be very difficult; however, careful estimates based on experience and efficient record keeping should yield reasonably accurate figures for the purposes of forecasting domestic water use. Water suppliers also should recognize that there can be a considerable lead time in obtaining the needed information, and should plan accordingly.

1. The public water supplier must provide the following information from its Annual Statistical Reports provided to MassDEP or from other sources, for at least the last three, but preferably five, years:
 - (a) Water supply information, including metered volumes of water pumped, water purchased, and water sold.
 - (b) Water-use information based on actual metering;
 - (c) A breakdown of water use into residential, nonresidential, unaccounted-for, and treatment plant loss categories;
 - (d) Service population, both year-round and seasonal;
 - (e) Other related information as determined by WRC staff after initial consultations.
2. Based on the information in #1, and additional information that may be available, the following criteria will be considered by WRC staff in determining whether data are sufficient to allow preparation of a forecast. (If these conditions cannot be met, refer to Part E - Temporary Allocations of Water):
 - (a) The commonwealth's standard for unaccounted-for water is 10% of the total amount of water entering the distribution system. In cases where the three-year average is substantially higher or lower (i.e., exceeds 15% or is lower than 5%), water suppliers and/or communities should consult with WRC staff to assess the feasibility of developing a forecast with current data.
 - (b) The commonwealth's standard for residential water use is 65 gallons per capita per day (gpcd). In cases where the three-year average is substantially higher or lower (i.e., exceeds 85 gpcd or is lower than 45 gpcd), water suppliers and/or communities should consult with WRC staff to assess the reliability of the data and the feasibility of developing a forecast with current data.
3. A community or public water supply system with an existing WMA permit must demonstrate that the conservation conditions of its permit have been met. MassDEP will confirm that the conditions have been met or substantially complied with, or an approved plan is in place to meet the conditions in a reasonable and specified time.

A Water Conservation questionnaire (WRC, March 12, 2008) must also be submitted with the Water Management Act permit or permit renewal application. The questionnaire provides an

overview of system operations and water conservation programs. It is available at <http://www.mass.gov/dcr/waterSupply/intbasin/download.htm>.

E. Temporary Allocations of Water

Public water suppliers that cannot provide information required to develop a water needs forecast as described above, or cannot meet the conditions noted in section D, should consult with WRC staff. In these cases, MassDEP may issue a permit with a temporary allocation of water. This temporary allocation volume is based on the most recent three to five years of water use by the public water supplier and is developed by WRC staff in consultation with MassDEP. The temporary allocation can be permitted under the WMA permitting program and may be subject to all the conditions and requirements of that program. Factors considered in determining the temporary allocation volume include, but are not limited to, recent use, number of new users, nonresidential development, changes in system operations, infrastructure condition, and new metering information. This temporary allocation is intended to provide a stop-gap volume to water suppliers whose permits are expiring or who can demonstrate a pressing need for water above an existing permitted or registered volume, but cannot meet the data requirements described in section D, above. For these water suppliers, the temporary allocation, and the Water Management Act permit that may include these volumes, is intended to be temporary and reflect short-term water needs (two to four years), until sufficient and adequate data can be developed to clearly document current use and future, longer-term water needs.

MassDEP requires those permitted with temporary allocations to collect and submit the data needed to calculate current water use and future needs within four years of the permit issuance date. It is expected that communities receiving a temporary allocation will develop and implement a plan to comply with the requirements noted in section D above, and the requirements and conditions in their WMA permit. MassDEP may also require the water supplier to provide interim reports containing the required information before the five-year permit review under the Water Management Act. Upon submittal of that additional information, WRC staff will determine whether the information is sufficient and accurate enough to develop a water needs forecast for the remaining years of the permit period or if other steps are required, including compliance with administrative consent orders or other actions required by MassDEP.

Once the data are determined to be sufficient, WRC staff will prepare a water needs forecast. Should the forecast indicate that future water needs are less than the volumes used in the temporary allocation, MassDEP will allocate volumes through a permit modification consistent with those developed in the forecast.

III. GENERAL WATER NEEDS FORECASTING METHODOLOGY FOR PUBLIC WATER SUPPLY SYSTEMS

This methodology presents the topics and calculations needed to complete the development of a forecast. The methodology uses three to five years of water use (called Base Demand) for each public water supplier. Water-use data are disaggregated into five categories: residential, nonresidential (including commercial, industrial, agricultural, and municipal), water treatment plant losses, unaccounted-for water (UAW), and water sold. The main components of this disaggregated approach and the calculations used to arrive at the forecast are detailed below.

The forecast will address the water needs of the community served by the public water supply system. Water sold to individuals who have a direct, metered service connection to the water supplier's system, but who reside outside the boundaries of the community served by the water system, is included in the forecast of the system's water needs. However, this methodology does not forecast water that is sold by the public water supplier to another community or water system. Such wholesale water sales are tracked separately as described below.

Forecasts usually are for the 20-year period coinciding with the WMA permit period. A general expectation in the policy is that water conservation and efficiency will increase for existing and future residents, commercial and industrial enterprises, municipal facilities, and water supply systems. The implementation of this methodology may vary slightly among public water suppliers and communities to reflect individual community circumstances or alternate sources of data.

Definitions

Average Day Demand (ADD) is the total water consumption by all users in the service area, averaged over the calendar year and measured in millions of gallons per day (mgd). In this methodology, ADD includes all raw water pumped and water purchased minus water sold to other water supply systems.

Base Demand is the average of three to five years of ADD selected from among the most recent five years, based on quality of record-keeping and availability of data.

Base Service Population is the number of people served by the public water supply system averaged over three to five years.

Gallons per Capita per Day (gpcd) is the average of daily residential water use measured in gallons used per person in the service area.

Nonresidential Water Use includes metered industrial, commercial, institutional, agricultural, recreational, and municipal water uses within the service area. Also included are confidently estimated municipal uses, in accordance with guidelines issued by MassDEP.

Treatment Plant Processing Loss is water consumed in the operations of the municipal water treatment plant. It is generally determined by subtracting metered amounts of finished water from metered amounts of raw water.

Seasonal Population is the number of people served by the public water supply system who do not live year-round in the service area but who reside in the service area during certain months of the year.

Unaccounted-for water (UAW) is the residual resulting from the total amount of water supplied to a distribution system as measured by master meters, minus the amount of water sold to other systems, minus the sum of all amounts of water measured by consumption meters in the distribution system, and minus confidently estimated and documented amounts used for certain necessary purposes as specified by MassDEP.

Water Sold is the amount of water delivered to the water system of another water supplier, as reported on the Annual Statistical Reports submitted to MassDEP.

Abbreviations

ADD	average day demand
ASR	Annual Statistical Report
EOEA	Executive Office of Environmental Affairs (now EOEEA)
EOEEA	Executive Office of Energy and Environmental Affairs (formerly EOEA)
gpcd	gallons per capita per day
MassDEP	Massachusetts Department of Environmental Protection
mgd	million gallons per day
PWS	public water supplier
UAW	unaccounted-for water
WMA	Water Management Act (MGL Ch. 21G)
WRC	Water Resources Commission

The sample spreadsheet at the end of this document shows the columns referred to in the following description of the methodology.

Column A identifies the water supplier or community for which the projection is being done.

Columns B through F show data on service population. Data are obtained from the water supplier, town planner or clerk, regional planning agency, or other sources.

- Column B shows the average (three to five years) year-round population estimate for the entire community.
- Column C shows the percentage of the community's population served by the water supply system, on average, or in the most recent year.
- Column D shows the average (three to five years) of out-of-town residents who are served by direct, metered connections to the water supply system.
- Column E shows the annualized additional seasonal population, which is calculated by multiplying the additional seasonal population by the percentage of the year that this additional population resides in the service area. For instance, if a community estimates that during the summer months of June, July and August, an extra 1,200 semi-permanent residents

use public water in the community, 1,200 is multiplied by 25% (i.e., one-fourth of the year) to obtain an annualized seasonal population of 300.

- Column F, the base service population, is calculated by multiplying column B, the average year-round population, by column C, the percent of the population served by the water supplier, then adding column D, the out-of-town population, and column E, the annualized seasonal population, to this product.

Columns G through P show the water use for the base period.

- **Column G**, base system average day demand (ADD), shows the average of the average day demand, in million gallons per day, for a three- to five-year period of water use. The water-use information is based on raw water pumped and water purchased, minus water sold, as reported on the ASR and submitted by the water supplier to MassDEP.
- **Columns H through J** show the residential portion of the base system ADD.
 - Column H (residential ADD) shows the average of the ADD of metered residential water use, in million gallons per day, for a three- to five-year period. Metered residential consumption is reported on the ASRs.
 - Column I, the percentage of base system ADD used by the residential service population, is calculated by dividing column H (residential ADD) by column G (base system ADD).
 - Column J, the residential water use, in gpcd, is calculated by dividing column H, residential ADD, by column F, base service population, and converting from million gallons to gallons by multiplying by one million.
- **Columns K and L** show the nonresidential portion of the base system ADD. See the definitions section for categories of nonresidential use.
 - Column K (nonresidential ADD) shows the average of the ADD of metered nonresidential water use, in million gallons per day, for a three- to five-year period. Metered nonresidential consumption and confidently estimated municipal uses are reported on the ASRs.
 - Column L, the percentage of base system ADD used by the nonresidential sector, is calculated by dividing column K (nonresidential ADD) by column G (base system ADD).
- **Columns M and N show treatment plant processing losses.** See the definitions section.
 - Column M shows the average volume of water used daily over a three- to five-year period in municipal treatment plant system operations, as reported by the water supplier in the ASRs provided to MassDEP.
 - Column N, the percentage of base system ADD represented by treatment plant processing losses, is calculated by dividing the volume in Column M by the base system ADD (column G).
- **Columns O and P** show base unaccounted-for water. See the definitions section.
 - Column O, the average daily unaccounted-for water, is calculated by subtracting the residential and nonresidential water use and treatment plant losses from the total water

use shown in column G; thus

$$O = G - (H + K + M).$$

- Column P shows UAW as a percentage of the water calculated to enter the distribution system. Column P is calculated by dividing the UAW ADD (column O) by base system ADD (column G) minus treatment plant processing losses (column M)

Columns Q through V show how population is projected to change through the end date for the water needs forecast. Data for columns Q through T are obtained from the regional planning agency, the town, or other sources of demographic data.

- Column Q shows the population projection for the entire community, in five-year increments over a twenty-year period.
- Column R shows the percentage of the community's population that will be served by the water supply system in the future in the same five-year increments. This percentage is obtained through discussions with the water supplier.
- Column S shows the future out-of-town population served in five-year increments.
- Column T, the future annualized additional seasonal population in five-year increments, is the number of seasonal residents served by a public water supplier calculated on an annual basis. The method of calculation is the same as that used for column E (annualized additional seasonal population). In certain areas with substantial seasonal populations, a more detailed assessment may be carried out by separately studying year-round and seasonal population and water use.
- Column U, the future population served, is calculated for each five-year increment by multiplying the future year-round population, column Q, by the percentage of the population to be served in the future, column R, and adding the future out-of-town population, column S, and the future annualized seasonal population served, column T.
- Column V, the change in service population, is calculated for each five-year increment as the difference relative to the prior five-year increment (beginning with the difference from the present-day service population, Column F).

Columns W and X show how residential water use is projected to change through the end of the forecast period.

- Column W represents the future residential water consumption rate, in gpcd, for the future population.

The water needs forecasting policy reflects the Water Conservation Standard that water suppliers should meet, or demonstrate steady progress toward meeting, residential water use of 65 gpcd as soon as practicable. For any public water supply with an existing residential water use above 65 gpcd, it is assumed that the water supplier and community will undertake all practical efforts to make steady progress toward reducing this residential water use.

For a water needs forecast that is developed to support a WMA permit application, WRC staff will typically develop forecasts for two scenarios: one scenario showing projected water needs if the 65 gpcd standard were to be achieved within the first five-year block and met throughout the twenty-year permit period, and one scenario which shows projected water needs if current gpcd trends were to continue. MassDEP will select the appropriate forecast to

apply in each five-year block of the WMA permit, based on unique local conditions and the Water Management Act Permitting Policy in effect at the time the permit is being prepared.

For water needs forecasts that are developed to guide water suppliers in their water supply planning efforts not related to WMA permitting, WRC staff will use the same methodology. Water suppliers are encouraged to discuss their specific issues with WRC staff.

- Column X, the future residential average daily demand (in mgd), is calculated by multiplying the base service population (column F) by the residential water consumption rate, in gpcd, for the future population (column W). The product is divided by one million to obtain the projected residential ADD in million gallons per day.

Column Y represents the future nonresidential average day demand (in mgd). It is estimated using information on water used by the nonresidential sector, as reported on the ASR, and employment data obtained from the appropriate regional planning agency. Future nonresidential demand is calculated as follows:

1. The base volume, in gallons, for nonresidential users is calculated by averaging water use in the nonresidential sector, as reported on the ASRs, for a three- to five-year period.
2. A base nonresidential ADD, in million gallons per day, is calculated by dividing the average base volume by 365 days and converting to million gallons per day by dividing by one million.
3. The current number of employees in the water supplier's service area is interpolated from employment forecasts prepared by the regional planning agency.
4. The future number of employees in the water supplier's service area is interpolated, for each five-year period of the twenty-year planning period, from the employment forecasts prepared by the regional planning agency.
5. The percent change in employment (increase or decrease) is calculated for each five-year planning period, starting with the percent change from employment interpolated for the current year. (In the example, the "current year" is 2007.)
6. The future nonresidential ADD for each planning period is calculated by multiplying the nonresidential ADD (step 2) for the previous planning period (starting with the base nonresidential ADD) by the percent change (step 5) from one planning period to the next (generally five-year planning periods), and adding in the nonresidential ADD from the previous period.

Column Z represents future average-day demand (in mgd) attributable to unaccounted-for water. To estimate future UAW, columns X and Y (future residential and nonresidential ADD) are added together and then multiplied by a target percentage for future UAW.

The water needs forecasting policy reflects the Water Conservation Standard that water suppliers should meet, or demonstrate steady progress toward meeting, a limit of 10% unaccounted-for water as soon as practicable. For any public water supply with existing UAW above 10 percent, it is assumed that the community will undertake all practical efforts to make steady progress toward reducing UAW and achieving 10% or less as soon as practicable.

For a water needs forecast that is developed to support WMA permit applications, WRC staff will typically develop forecasts for two scenarios: one scenario showing projected water needs if the 10% UAW standard were to be achieved within the first five-year block and met throughout the twenty-year permit period, and one scenario which shows projected water needs if current UAW trends were to continue. MassDEP will select the appropriate forecast to apply in each five-year block of the WMA permit based on unique local conditions and the Water Management Act Permitting Policy in effect at the time the permit is being prepared.

For water needs forecasts that are developed to guide water suppliers in their water supply planning efforts not related to WMA permitting, WRC staff will use the same methodology. Water suppliers are encouraged to discuss their specific issues with WRC staff.

Column AA, Future Significant Change ADD, represents the future increase or decrease in ADD resulting from large expected deviations from current water-use trends, such as a new water-intensive industry moving to town. These are specific, known projects not captured in column Y (future nonresidential ADD) or in population and employment projections developed by the regional planning agency. Data for column AA are obtained from the water supplier, town planner, or regional planning agency.

Column AB is the average daily volume of water estimated to be used in water treatment plant operations in the future. The percentage is assumed to be the same as the current percentage (column N). Future treatment plant processing losses are calculated by adding the future residential ADD (column X), future nonresidential ADD (column Y), future UAW ADD (column Z), and future significant change ADD (column AA) and applying the percentage from column N.

Column AC, the forecasted ADD, is calculated by adding columns X, Y, Z, AA, and AB.

Additional Information

Buffer Amount. A 5% buffer is added to the projected ADD for the final five-year period of the water needs forecast. This 5% buffer is intended as a contingency in the event that unanticipated growth results in a need for additional water during the forecast period. This buffer will be used at MassDEP's discretion, after a review of the system's water use patterns.

Water Sold to Other Water Suppliers. Some public water suppliers have the capacity to sell water to other water supply systems. Because such water sold is pumped outside the area under the jurisdiction of the water supplier, WRC staff will summarize information available on these wholesale water sales but will not attempt to forecast a future need for water sold. Information on water sold over the base period, usually three to five years, is obtained from the ASRs. WRC staff will include the average annual volume of water sold over the base period as a separate category in the forecast. Additional relevant information about water sold may also be obtained from the water supplier and reported for consideration in Water Management Act permitting. Such information may include, for example, the maximum volume of water sold in a single year during the base period or the volume of water stipulated in contracts between water suppliers who have contractual purchase/sale agreements.

In some cases, where a water supplier furnished 100% of the water used by another water system, WRC staff will develop a forecast for the (consecutive) purchasing system and add this demand to the forecast for the system that sold the water.

REFERENCES

The web site of the Executive Office of Energy and Environmental Affairs may be found through www.mass.gov. Documents related to the Water Resources Commission may be found by following links under the categories “Air, Water & Climate Change” and “Preserving Water Resources.” Documents may also be requested by contacting WRC staff.

Executive Office of Environmental Affairs and Water Resources Commission. July 2006. Water Conservation Standards.

Executive Office of Environmental Affairs. November 2004. Massachusetts Water Policy.

Water Resources Commission. April 1996. Massachusetts Water Supply Policy Statement, 1996 Update.

Water Resources Commission. February 2001. Policy for Developing Water Needs Forecasts for Public Water Suppliers.

Water Resources Commission. September 13, 2001, Update. Interbasin Transfer Act Performance Standards Guidance. Available at <http://www.mass.gov/dcr/waterSupply/intbasin/download.htm>.

Water Resources Commission. March 12, 2008. Water Conservation Questionnaire for Public Water Suppliers. Available at <http://www.mass.gov/dcr/waterSupply/intbasin/download.htm>.



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WATER RESOURCES COMMISSION

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NOTE: This spreadsheet is part of the May 1, 2009, Policy for Developing Water Needs Forecasts for Public Water Suppliers and Methodology for Implementation

BASELINE CONDITIONS, 2007

In this example, "base" for 2007 represents data from 2003 through 2007

Seasonal population of 1,200 is annualized as follows: $1,200 \times 25\%$ (3 months) = 300

ADD = Average Day Demand; shown in million gallons per day

GPCD = gallons per capita per day

mgd = million gallons per day

	Current Population				
(A)	(B)	(C)	(D)	(E)	(F)
	Average Year-Round Town Pop	2007 % Serv Pop	2007 Out-of-Town Pop	2007 Annualized Add'l Seas Pop	Base Service Pop
Community					
OurTown	6,000	94%	30	300	5,970

Column F = $(B \times C) + D + E$

Base Water Use									
	Residential			Nonresidential		Treatment Loss		UAW	
(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)	(P)
Base System ADD (mgd)	Res ADD (mgd)	Res % of Base ADD	Res GPCD	Non-Res ADD (mgd)	Non-Res % of Base ADD	Treatment Plant Processing Loss (mgd)	% Treatment Plant Processing Loss	Base UAW ADD (mgd)	UAW % of Base ADD (minus TPL)
0.59	0.44	75%	74	0.04	7%	0.02	3.4%	0.09	15.8%

Column I = H / G

Column J = $H / F \times 1,000,000$

Column L = K / G

Column N = M / G

Column O = $G - (H + K + M)$

Column P = $O / (G - M)$



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Nonresidential Water Use (Column Y)

(1) Employment Projections (Column Y, Steps 3 to 5)

	2000	2007	2010	2014	2019	2020	2024	2029	2030
Employment Projections	925	954	967	1,006	1,054	1,064	1,088	1,119	1,125
Percent increase in each planning period				5.39%	4.82%		3.23%	2.80%	

(2) Projections of Nonresidential Water Use (Column Z, Steps 1, 2, and 6)

	Base NonRes Vol (gal)	Base NonRes ADD (mgd)	2014 NonRes ADD (mgd)	2019 NonRes ADD (mgd)	2024 NonRes ADD (mgd)	2029 NonRes ADD (mgd)
Community						
OurTown	14,600,000	0.0400	0.0422	0.0442	0.0456	0.0469

Note: all the numbers in the above tables are rounded.

WATER NEEDS FORECASTS

Scenario 1: Water Conservation Standards achieved in 5 years

Year	POPULATION						RESIDENTIAL		NON-RES	UAW		Treatment Loss	
	(Q)	(R)	(S)	(T)	(U)	(V)	(W)	(X)	(Y)	(Z)	(AA)	(AB)	(AC)
	Future Year-Round Pop	Future % Service Pop	Future Out-of-Town Pop	Future Annualized Add'l Seas Pop Served	Future Pop Served	Pop change, Present - Future	Future Res Consumption Rate (GPCD)	Future Res ADD (mgd)	Future Non-Res ADD (mgd)	Future UAW ADD (mgd)	Future Signif. Change ADD (mgd)	Future Treatment Plant Processing Loss (mgd)	Future Total ADD (mgd)
2014	6,150	98%	40	421	6,488	518	65.00	0.42	0.0422	0.05	0.03	0.0191	0.56
2019	6,300	98%	40	421	6,635	147	65.00	0.43	0.0442	0.05	0.02	0.0192	0.57
2024	6,458	98%	40	421	6,790	155	65.00	0.44	0.0456	0.05	0.01	0.0193	0.57
2029	6,615	98%	40	421	6,944	154	65.00	0.45	0.0469	0.05	0.00	0.0194	0.57

Column U = (Q x R) + S + T

Column V = U – F

Column X = (U x W) / 1,000,000

Column Z = ((X + Y) x 0.1) / 0.9

Column AB = ((X + Y + Z + AA) x N / 1 - N

Column AC = X + Y + Z + AA + AB

Note: Some numbers may be rounded in the above example.

SUMMARY

Assuming 65 rgpcd and 10% unaccounted-for water:

	2014	2019	2024	2029
Projection (mgd)	0.56	0.57	0.57	0.57
Five Percent Buffer (mgd)				+ 0.03

Assuming water use continues at current rgpcd and unaccounted-for water levels during the permitting period:

	2014	2019	2024	2029
Projection (mgd)	0.67	0.68	0.68	0.69
Five Percent Buffer (mgd)				+ 0.03

Average annual volume of water sold during the Base Period: XX mgd

